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PTO/SB/29 (12/97)

Approved for use through 09/30/00. OMB 0651-0032

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**UTILITY  
PATENT APPLICATION  
TRANSMITTAL**

(Only for new nonprovisional applications under 37 CFR 1.53(b))

Attorney Docket No. 10248-015 Total Pages 38

First Named Inventor or Application Identifier

GYLLERSTROM

Express Mail Label No. \*\*HAND CARRY\*\*

**APPLICATION ELEMENTS**

See MPEP chapter 600 concerning utility patent application contents.

ADDRESS TO: Assistant Commissioner for Patents  
Box Patent Application  
Washington, DC 20231

1. ☐ Fee Transmittal Form  
Submit an original, and a duplicate for fee processing)

2. ☒ Specification [Total Pages 24]  
(preferred arrangement set forth below)

- Descriptive title of the Invention
- Cross Reference to Related Applications
- Statement Regarding Fed sponsored R&D
- Reference to Microfiche Appendix
- Background of the Invention
- Brief Summary of the Invention
- Brief Description of the Drawings (if filed)
- Detailed Description of the Invention (including drawings, if filed)
- Claim(s)
- Abstract of the Disclosure

3. ☒ Drawing(s) (35 USC 113) [Total Sheets 12]

4. ☒ Oath or Declaration (Unexecuted) [Total Sheets 2]

- ☐ Newly executed (original or copy)
- ☐ Copy from a prior application (37 CFR 1.63(d))  
(for continuation/divisional with Box 17 completed)  
[Note Box 5 below]

i. ☐ DELETION OF INVENTORS(S)

Signed statement attached deleting inventor(s) named in the prior application, see 37 CFR 1.63(d)(2) and 1.33 (b).

5. ☐ Incorporation By Reference (useable if Box 4b is checked)  
The entire disclosure of the prior application, from which a copy of the oath or declaration is supplied under Box 4b, is considered as being part of the disclosure of the accompanying application and is hereby incorporated by reference therein.

6. ☐ Microfiche Computer Program (Appendix)

7. ☐ Nucleotide and/or Amino Acid Sequence Submission  
(if applicable, all necessary)

- a. ☐ Computer Readable Copy
- b. ☐ Paper Copy (identical to computer copy)
- c. ☐ Statement verifying identity of above copies

**ACCOMPANYING APPLICATION PARTS**

8. ☐ Assignment Papers (cover sheet & documents)

9. ☐ 37 CFR 3.73(b) Statement ☐ Power of Attorney  
(when there is an assignee)

10. ☐ English Translation Document (if applicable)

11. ☒ Information Disclosure ☒ Copies of IDS  
Statement (IDS)/PTO-1449 Citations

12. ☐ Preliminary Amendment

13. ☒ Return Receipt Postcard (MPEP 503)  
(Should be specifically itemized)

14. ☐ Small Entity Statement filed in prior application,  
Statement(s) Status still proper and desired

15. ☐ Certified Copy of Priority Document(s)  
(if foreign priority is claimed)

16. ☐ Other:

17. If a CONTINUING APPLICATION, check appropriate box and supply the requisite information:

☐ Continuation ☐ Divisional ☐ Continuation-in-part (CIP) of prior application No: filed .

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## RAZOR WITH A MOVABLE SHAVING HEAD

### TECHNICAL FIELD OF THE INVENTION

This invention relates to shaving razors and, more particularly, to razors with  
5 movable shaving heads that move about or on multiple axes with respect to a handle.

### BACKGROUND OF THE INVENTION

Because a shaving surface, for example, the face or the legs, is usually not a planar  
surface, it is common for a shaving razor to have a shaving head that is pivotable with  
10 respect to a razor handle to allow a user to be able to follow the contours of the shaving  
surface. Typically, however, a shaving razor has a razor blade carrier that is pivotable only  
about a single axis, which is parallel to the cutting edge of the razor blade. With such a  
shaving razor, the entire cutting edge of the shaving razor may not be utilized during  
shaving, which leads to uneven wear of the cutting edge and increases the time it takes to  
15 shave.

Accordingly, a desirable feature of a shaving razor is to have a shaving head that is  
pivotable about multiple axes. Another desirable feature of a shaving razor is to have a  
shaving head that provides a cushioning action when pressed against the razor handle. One  
example of a shaving razor having such features is disclosed in U.S. Patent No. 4,347,663  
20 to Ullmo. Ullmo discloses a razor handle having a pair of tabs projecting outwardly from  
one end of the razor handle. Each tab has an elongated slot therethrough. A blade assembly  
carrier is pivotably mounted to the handle by engagement of two pairs of ears on the carrier  
with the tabs on the handle. Specifically, the spacing between each pair of ears is slightly  
greater than the width of each tab so that a tab may be received between a pair of ears. The  
25 ears have openings therethrough sized to receive a rivet. Alignment of the openings in the  
ears with the slots in the tabs allows the ears and the tabs to be coupled together by the  
rivets. The blade assembly carrier is pivotable about the rivets. A pair of helical springs are  
provided in openings in the tabs for biasing the blade assembly carrier into a rest position.  
This arrangement purportedly creates a "lost motion connection," which allows pivotable  
30 motion of the carrier about the rivets, translational motion of the carrier toward and away  
from the handle, and "yawing" motion of the carrier about the longitudinal axis of the razor  
handle.

A disadvantage to the shaving razor disclosed in Ullmo is that it requires the  
manufacture and assembly of a number of discrete components. This is undesirable because  
35 it increases the manufacturing and assembly time. Moreover, once the tabs and ears are  
riveted together, the blade assembly carrier and razor handle cannot readily be detached.

Accordingly, it would be desirable to have a shaving razor with a movable shaving head that is simple and inexpensive to manufacture and assemble. Moreover, it would be desirable to have a shaving razor with a shaving head that may be easily detachable, if desired, from the razor handle.

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## SUMMARY OF THE INVENTION

The present invention is directed to a razor that includes a handle that defines a longitudinal axis, a head that carries at least one blade and defines a transverse axis parallel to the blade(s), a connector assembly, and a biasing element. The connector assembly  
10 moveably couples the handle to the head and allows the head to pivot forward and backward about an axis parallel to the transverse axis (a "pitching" movement), and also allows the head to move toward and away from the handle. The biasing element biases the head into a rest position against the forward and backward pivoting movement and against the movement toward and away from the handle. In this arrangement, when the head is out of  
15 the rest position, the transverse axis can be oblique or perpendicular with respect to the longitudinal axis depending on at least the force applied to the head. When the ends of the head are alternately moving toward and away from the handle or the transverse axis is oblique with respect to the longitudinal axis during the movement toward and away from the handle, the movement is called a rolling movement. When the transverse axis is  
20 perpendicular to the longitudinal axis during movement toward and away from the handle, the movement is called a cushioning movement.

In one embodiment, the connector assembly includes pins and the razor head includes cutouts for receiving the pins, wherein the cutouts have dimensions greater than the dimensions of the pins to allow the pivoting movement and the rolling and cushioning  
25 movements. More generally, a razor having a shaver head and handle which are movably coupled together may be modified in accordance with the present invention to increase the degrees of freedom of movement between the head and the handle. For instance, if the head and handle are coupled by insertion of an insertion element on one into an opening in another, the size of the opening may be increased to permit greater range of motion therein,  
30 resulting in a greater range of motion between the head and handle.

According to one aspect of the invention, the biasing element may be spaced apart from the connector assembly to permit independent action of the connector assembly and the biasing element. In one embodiment, the biasing element is at least one leaf spring disposed between the handle and the head with movable free ends biasing the head into a  
35 rest position. In this arrangement, the free ends can include cam surfaces operatively

associated with a cam surface on the razor head so that the cam surfaces contact one another to bias the head into the rest position against the pivoting movement. Alternatively, the biasing element can be a spring-loaded tongue which moves along a longitudinal biasing axis.

- 5           The shaving head may be a razor blade cartridge formed for ready detachment from the handle and replacement with a new cartridge. Alternatively, the razor may be a disposable razor in which the head and handle are disposed of, together, once the blades become dull.

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### BRIEF DESCRIPTION OF THE DRAWINGS

To facilitate the understanding of the characteristics of the invention, the following drawings have been provided wherein:

- 15           Fig. 1 is a perspective view of an exemplary shaving razor in accordance with the present invention;

            Fig. 2 is a partially exploded, perspective view of the shaving razor of Fig. 1;

            Fig. 3 is a bottom, perspective view of a shaving head according to a preferred embodiment of the present invention for use in the razor of Fig. 1;

- 20           Fig. 4 is an enlarged, bottom, perspective view of a portion of the shaving head within the area designated by arrow 4 of Fig. 3;

            Fig. 5 is a bottom, elevational view of the shaving head of Fig. 3;

            Fig. 6 is a front, perspective view of a neck piece according to a preferred embodiment of the present invention for use with the shaving head of Fig. 3;

- 25           Fig. 7 is an enlarged, front, perspective view of a portion of the neck piece within the area designated by arrows 7 of Fig. 6;

            Fig. 8 is an enlarged, partial, perspective view of the razor of Fig. 1 with the shaving head engaged with the neck piece;

            Fig. 9 is an exploded, partial, side perspective view of the razor of Fig. 1 with the shaving head disengaged from the neck piece;

- 30           Fig. 10 is a partial, elevational view of the razor of Fig. 1, wherein the shaving head is in a first or rest position;

            Fig. 11 is a partial, elevational view of the razor of Fig. 10, wherein the shaving head is in a pivoted position;

- 35           Fig. 12 is a partial, elevational view of a portion of an alternative embodiment of a shaving head of the present invention;

Fig. 13 is a front, perspective view of an alternative embodiment of a neck piece for use with a shaving head similar to the head of Fig. 3;

Fig. 14 is a partial, plan view of an alternative embodiment of a neck piece for use with a shaving head similar to the head of Fig. 3; and

5 Fig. 15 is a partial, perspective view of an alternative embodiment of a handle for use with a razor according to the present invention.

#### DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

The present invention is directed to a razor that generally comprises a handle, a  
10 shaving head carrying blades, a connector assembly for joining the head to the handle and a biasing element. The connector assembly is configured and dimensioned to allow the head to move with respect to the handle. Preferably, the connector assembly includes a head-engaging element on the handle and a handle-engaging element on the shaving head, the head-engaging element and the handle-engaging element cooperating to couple the head and  
15 handle together while permitting relative movement therebetween. The biasing element is preferably spaced apart from the connection assembly to permit a full range of motion between the handle and the shaving head. The razor and components thereof shown in the following drawings are exemplary of razors and components in accordance with the principles of the present invention. The present invention can be utilized with various  
20 configurations of handles, heads, connection assemblies, and biasing elements, and thus the present invention is not limited to any particular types of razor configurations shown and discussed below.

Referring to Figs. 1 and 2, there is shown an exemplary razor 20 formed in accordance with the principles of the present invention. Razor 20 includes a shaving head  
25 or razor blade carrier 22 and a razor handle 24. A handle such as disclosed in U.S. patent No. 5,727,328, which patent is hereby incorporated by reference, may be used. As shown in Figs. 1 and 2, handle portion 25 has a top end 26 and a bottom end 28. Razor 20 has a longitudinal axis L along which the largest/longest dimension of handle portion 25 extends. Shaving head 22 carries one or more blades 30 with cutting edges 32 thereof in appropriate  
30 positions for effective shaving. Transverse axis T of shaving head 22 is substantially parallel to cutting edges 32. Shaving head 22 may be a disposable cartridge formed for ready detachment from the handle and replacement with a new cartridge. Alternatively, razor 20 may be a disposable razor 20 in which shaving head 22 and handle 24 are disposed of, together, once blades 30 become dull.



In the embodiment of Figs. 1 and 3, shaving head 22 is constructed as a one-piece, injection-molded component with a generally rectangular structure that is elongated along a transverse axis T parallel to cutting edges 32 of razor blades 30 carried by shaving head 22. Shaving head 22 may include any of the guard, blade seat, and cap features that are well-known in the art. The configuration of head 22 is exemplary, and in another embodiment, head 22 can be modified as known by those of ordinary skill in the art.

Referring to Fig. 3, shaving head 22 includes a central, longitudinal axis  $L_H$  about which the head is substantially symmetrical. Axis  $L_H$  is also parallel to longitudinal axis  $L$  (as shown in Fig. 1) of razor 20 when shaving head 22 is in a rest position. Shaving head 22 defines a first side I and a second side II divided by and preferably symmetrical about axis  $L_H$ .

Shaving head 22 further includes a base 44 (e.g., the blade seat on which blades 30 are mounted or a component thereof) which may include any desired features. Base 44 is configured for engagement with handle 24 and may include a handle-engaging element to that effect, as discussed in greater detail below. In addition, base 44 preferably includes a guard bar 45 and may include various components that extend downwardly therefrom, such as a peripheral lip 46 including resilient segments 46a-d, a plateau-like projection 48, a pair of lower members 50a and 50b, a pair of medial connection members 52a and 52b, and a pair of projections 54a and 54b. It will be appreciated that additional or different components may be provided on base 44, or the aforementioned components may not be included, without defeating the principles of the present invention.

Referring to Figs. 3 and 4, the peripheral lip 46 is formed about the periphery of base 44 and includes front segment 46a, back segment 46b, and side segments 46c and 46d. The inner surface of front segment 46a includes a plurality of inwardly extending claws or projections 56. As best seen in Fig. 4, each of the claws 56 preferably has a triangular cross-sectional shape. Claws 56 may be provided to engage an adapter unit such as disclosed in PCT Application No. PCT/US98/19997, filed September 24, 1998, with the

inventor Gratsias named, which PCT application is incorporated herein by reference in its entirety.

A plateau-like projection 48 extends from the center of base 44 aligned with axis  $L_H$  and an optional internal wall 58. Projection 48 may serve as a camming surface for a biasing element, as described in greater detail below. It will be appreciated that projection 48 may be configured differently than as shown and need not even project beyond adjacent portions of base 44, particularly if the illustrated configuration is not suitable for the desired function of projection 48.

A pair of lower support structures 50a and 50b and a pair of medial connection members 52a and 52b extend from base 44 on either side of projection 48 with lower support structures 50a and 50b adjacent back segment 46b. Supports 54a and 54b extend from base 44 adjacent to side segments 46c and 46d, respectively.

Referring to Figs. 3 and 4, supports 50a and 50b extend between base 44 and guard bar 45 (if provided). Supports 50a and 50b support guard bar 45 perpendicularly, during shaving, in order to retain the same distance from blade edges 32 along the entire width of guard bar 45 and blades 30, thereby maintaining a constant skin gap distance. Preferably, supports 50a and 50b include transversely extending members 58a and 58b such as for adding rigidity to base 44 and the overall system as well as for engagement of the adapter mentioned above.

Connection members 52a and 52b may be configured as a handle-engaging element with which handle 24, or a portion thereof, is engaged. Each of connection members 52a and 52b includes a member 60 that defines cutout 62. Cutouts 62 of connection members 52a, 52b together form the handle-engaging element and are configured to permit coupling of shaving head 22 to handle 24, such as via neck piece 34, for a floating connection, as will be described in further detail below. The length dimension  $L_1$  of cutouts 62 extends substantially perpendicular to base 44 for reasons as will become apparent.

Referring to Figs. 3, 4, and 5, base 44 further defines three sets of slots and/or holes. The sets of slots are best seen in Fig. 5, showing the top face of base 44 (opposite the bottom face shown in Fig. 3). Although only the slots in the sets on one side of axis  $L_H$  will be discussed, such descriptions are applicable to the slots on the opposite side of axis  $L_H$ . The first set of slots 64 is adjacent front segment 46a. Each slot 64 is transversely spaced from the adjacent slot so that each slot is aligned with one claw 56. Each of the slots 64 on the outer ends of the set can extend partially into front segment 46a to form cutouts (not shown) in front segment 46a.



Referring to Figs. 3 and 5, the third set of slots 70a-c are adjacent back segment 46b. As best seen in Fig. 5, slots 70a and 70c are disposed on either side of central slot 70b. Central slot 70b is aligned with member 58b of lower support member 50b positioned at the bottom face of base 44. Slots 70a-c are provided between base 44 and guard bar 45 and serve as water rinsing/cleaning areas.

Referring to Figs. 1 and 3, shaving head 22 is coupled to handle 24 by a connector assembly which, in a preferred embodiment, is a head-engaging element on handle 24 coupled to a handle-engaging element on base 44 of shaving head 22. The head-engaging and handle-engaging elements may be formed in any desired shape and/or configuration which enables floating movement of shaving head 22 with respect to handle 24. In the exemplary embodiment of Figs. 1-6, the head-engaging element includes insertion elements (or pins 84a, 84b) shaped for insertion into cutouts 62 in the handle-engaging element to permit floating support of shaving head 22 on handle 24. Moreover, as may be appreciated with reference to Fig. 8, the head-engaging element and the handle-engaging element of the connector assembly embodiment illustrated therein contact each other and are configured to couple head 22 and handle 24 together as a result of such coupling and contact. Of course, other arrangements of a connector assembly are possible in accordance with the principles of the present invention. For instance, the shaving head may include elements shaped for insertion into cutouts on the handle, instead.

A biasing element is preferably provided to bias the shaving head into a rest position, once forces are removed from the shaving head. In a preferred embodiment, the biasing element is separate and spaced from the connector assembly to permit independent functioning of the connector assembly and the biasing element.

Still referring to the exemplary neck piece 34 of Figs. 6 and 7, bridge portion 78 at distal end 74 of neck piece 34 includes a pair of posts 80a and 80b and a biasing element 81 therebetween. In this embodiment, the biasing element is a pair of cantilever, leaf-spring arms 82a and 82b. It will be appreciated that the present invention is not limited to the particular biasing element shown herein. The biasing element can be any component that applies a force on head 22 to move head 22 into a rest or first position. In accordance with one manner of embodying the present invention, the biasing element biases head 22 away from handle 24 and neck piece 34. Leaf-spring arms 82a and 82b are preferably symmetrically arranged about neck longitudinal axis  $L_N$  of neck piece 34.

Posts 80a and 80b extend upwardly from bridge portion 78 and have pins 84a and 84b, respectively, which extend transversely from posts 80a and 80b. Most preferably, pins 84a and 84b extend parallel to transverse axis T (as shown in Fig. 1). Although pins 84a and 84b are formed to extend outwardly from posts 80a and 80b, pins 84a and 84b can be formed to extend inwardly from the posts and still provide the benefits of the present invention so long as the shaving head is modified to function therewith. Preferably, posts 80a and 80b are resiliently yieldable and may be biased apart from or towards each other. Posts 80a, 80b and pins 84a, 84b form the head-engaging element and are one manner in which the head-engaging element may be embodied. If desired, a bracketing element (not shown) may be provided to secure the connection between posts 80a, 80b and respective cutouts 62 in shaver head 22, while nonetheless permitting the floating connection of head 22 to handle 24. Such bracketing element, as provided with the embodiment of Figs. 6 and 7, may be in the form of an additional post spaced laterally outward from posts 80a and 80b to permit members 60 of connection members 52a, 52b to be inserted between the bracketing element and its respective post.



axis T, as well as movement of all or part of head 22 closer to handle 24 (rolling or cushioning movement).

In the embodiment of Figs. 8 and 9, connection members 52a and 52b, particularly members 60 and cutouts 62 thereof, and posts 80a and 80b and pins 84a and 84b are

5 configured and dimensioned so that head 22 can move about and along multiple axes.

Thus, head 22 is able to pivot forward and backward (a pitching movement) about pins 84a and 84b and about pivot axis P through pins 84a and 84b (parallel to axis T) with respect to razor handle 24, as illustrated by arrow A, as well as in directions toward and away from handle 24 (and thus neck piece 34 or bridge portion 78), as illustrated by arrows B. The

10 movement in the direction of arrows B occurs when forces F are applied to head 22.

Specifically, when equal forces are applied to sides I and II of head 22, head 22 is pushed towards handle 24 and leaf-spring arms 82a and 82b both are compressed equally so that transverse axis T of head 22 remains perpendicular to longitudinal axes L and L<sub>N</sub> even when out of the rest position, resulting in a cushioning motion. Additionally, sides I and II of

15 head 22 may move along directions B independent of each other to effect a rolling motion of head 22. Thus, the relationship between transverse axis T and longitudinal axis L<sub>N</sub> of neck piece 34 changes from perpendicular to oblique in a rolling movement of head 22 about the axis L<sub>H</sub>. This movement is allowed by the configuration and dimensions of cutouts 62, holes 66d (as shown in Fig. 5), and pins 84a therein. In addition, the provision

20 of a biasing element enhances the cushioning and rolling motions. The biasing element (e.g., leaf springs 82a and 82b of the embodiment of Fig. 8) biases head 22 back into the rest position after any of the above-described movements of the head by biasing head 22 into a rest position with respect to handle 24. However, the configuration and dimensions of projection 48, and arms 82a and 82b, and cutouts 62 permit movement of head 22  
25 towards handle 24 against the biasing element to effect cushioning or rolling motions of head 22.

Thus, as will be appreciated, head 22 and handle 24 are coupled together to permit movement of head 22 with respect to handle 24 about and along more than one axis. In accordance with one aspect of the invention not necessary to achieve other aspects of the  
30 present invention, the biasing element may be provided separate and preferably spaced apart from the connector assembly. Such separation of these components permits the biasing element and the connector assembly to function independently. Thus, the function of the biasing element is unaffected by the position or orientation of head 22 with respect to handle 24. This is in stark contrast to the above-described shaving razor shown in the

35 Ullmo patent in which the biasing springs are fixed with respect to the tabs which connect

the handle to the head and therefore do not readily bias the head into a rest position if the head is pivoted about the rivet axes and away from the biasing springs.

Illustrative possible motions of head 22 with respect to handle 24 will now be described with reference to the embodiment of Figs. 6-11. As shown in Fig. 8, head 22 is in the rest position so that an angle  $\alpha$  between transverse axis T and neck longitudinal axis  $L_N$  is about  $90^\circ$ . In the rest position, a distance between leaf-spring arm 82a and bridge portion 78 is designated  $D1_R$ , and a distance between leaf-spring arm 82b and the bridge portion 78 is designated  $D2_R$ ,  $D1_R$  and  $D2_R$  being measured at the same distance from axis  $L_H$ . In the rest position, distance  $D1_R$  and distance  $D2_R$  are substantially equal.

Referring to Fig. 11, when at least one force F is applied to one side I of head 22, head 22 rolls as labeled D about axis  $L_H$  so that the angle  $\alpha$  changes from  $90^\circ$  to angle  $\alpha'$  that is less than  $90^\circ$ . In the rolled position, transverse axis T is oblique with respect to neck longitudinal axis  $L_N$ .

Furthermore, plateau-like projection 48 exerts a force on leaf spring arms 82a and 82b by camming engagement with cam surfaces 88a and 88b. In the rolled position of Fig. 11, the distance between leaf-spring arm 82a and bridge portion 78 is designated  $D1_p$  and the distance between leaf-spring arm 82b and bridge portion 78 is designated  $D2_p$ . As shown in Fig. 11, distance  $D1_p$  is substantially less than distance  $D2_p$ . Thus, one leaf spring arm 82a is compressed toward bridge portion 78 and the other leaf spring arm 82b is not compressed. When force F is released, the compressed leaf spring 82a acts in reverse on plateau-like projection 48 to bias head 22 to its original, rest position.

When a force is exerted on side II, springs 82a and 82b react similarly but in an opposite direction and spring arm 82b is compressed more than spring 82a so that head 22 exhibits a rolling movement in the opposite direction. The movable free ends of the leaf-spring arms 82a and 82b bias head 22 to the neutral, rest position when the force is removed, so that the head will return to the rest position. The rolling action shown in Fig. 11 can also occur when unequal forces are applied to sides I and II of head 22.

The upward and downward pivoting or pitching movement A (as shown in Fig. 9), the cushioning movement and effect toward and away from handle 24 in directions B (as shown in Fig. 8), and the rolling side-to-side movement D (as shown in Fig. 11) can occur simultaneously, independent of one another, or in various combinations.

Referring to Fig. 1, because of its multiple degrees of freedom (i.e., its ability to pivot about and along multiple axes) and the cushioning effect, head 22 of shaving razor 20 of the present invention permits the shaving edges of the razor blade or razor blades to conform more accurately to the contours of the skin surface being shaved.

Referring to Fig. 13, an alternative embodiment of a neck piece 234 is shown. Neck piece 234 is similar to neck piece 34 (as shown in Figs. 6 and 7) except for the configuration of leaf-spring arms 282a and 282b on bridge portion 278 of neck piece 234. Between posts 280a and 280b, there is disposed a Y-shaped spring member 281. Fixed end 285 of spring member 281 is joined to bridge portion 278 spaced from posts 280a and 280b. Spring member 281, in a direction away moving away from fixed end 285, has a member 287 that bifurcates at the free ends spaced from fixed end 285 into two leaf-spring arms 282a and 282b, which are resiliently yieldable so that they move in the directions indicated by arrow E. The free ends of arms 282a and 282b include cam surfaces 288a and 288b.

Neck piece 234 is engaged with head 22 or 122 of Figs. 3 or 12 by flexing posts 25 280a and 280b inwardly towards each other and inserting pins 284a, 284b thereon into cutouts 62 or into slots 162, respectively. Arms 282a and 282b of Y-shaped spring member 281 function in the same manner as leaf spring arms 282a and 282b to bias heads 22 or 122 into the rest position and to allow movement of head 22 or 122 about or along multiple axes.

Referring to Fig. 14, an alternative embodiment of a neck piece 334 is shown. Neck piece 334 is similar to neck piece 34 (as shown in Fig. 6) except for the location and configuration of posts 380a and 380b and leaf-spring arms 382a and 382b. On neck piece 334, posts 380a and 380b extend from the center of bridge portion 378 and arms 382a and 382b are disposed on either side of posts 380a and 380b. Fixed end 385 of each arm 382a and 382b is adjacent a respective post 380a and 380b and the free ends of arms 382a and

382b have cam surfaces 388a and 388b and are free to move in directions indicated by arrow B. Head 22 (as shown in Fig. 3) or head 122 (Fig. 12) must be modified so that the connection members for mating with posts 380a and 380b are in the appropriate position. Neck piece 334 and head 22 or 122 associated therewith function in the same manner as neck piece 34 and head 22 and allow movement of the head about or along multiple axes.

Referring to Fig. 15, an alternative embodiment of a handle 424 for use with a razor according to the present invention is illustrated. For example, handle 424 can be used with shaving heads 22 and 122 shown in Figs. 3 and 12. The handle 424 includes a main casing 427 and, extending from one end of the main casing 427, two arm members or posts 480a and 480b, and a central, spring-loaded tongue 482 that acts as the biasing element. Extending from the sides of main casing 427 are two buttons 483 which are operatively coupled to posts 480a and 480b, in any manner known by one of ordinary skill in the art, so that buttons 483 are able to move posts 480a and 480b with respect to each other. Posts 480a and 480b are normally maintained at a predetermined distance from each other determined by main casing 427 as well as the configuration of the shaving head to be coupled thereto.

Posts 480a and 480b include outwardly extending pins 484a and 484b, respectively, which define a pivot axis P about which a shaving head 22 or 122 may be pivotably coupled for a forward and backward pitching movement. The dimensions of pins 484a and 484b are such that they fit into cutouts 62 and 162, as shown in Figs. 3 and 12, respectively, enabling heads 22 and 122 to move toward and away from handle 424 for either rolling or cushioning movement independently or together with pivoting about axis P.

Although two buttons 483 are shown in the embodiment, of Fig. 15, the present invention is not limited to this number of buttons 483. For example, a single button can be used to move elements for connecting the handle to either a neck piece or directly to the shaving head.

As will be appreciated, the principles of the present invention are readily applied to a razor cartridge system in which the shaving head is a razor cartridge disposable separate from the handle, such as a system in which the handle of Fig. 15 may be used. Thus, the connector assembly of a razor cartridge system, such as with a handle as illustrated Fig. 15, is configured for ready coupling and decoupling of a razor cartridge to the handle. For instance, a cartridge-engaging element on the handle and a handle-engaging element on the cartridge may be configured to engage each other for removably coupling the cartridge and handle without the provision of an additional coupling element (such as a rivet, as in the above-discussed Ullmo patent). The principles of the present invention, thus may be

One advantageous application of the principles of the present invention is to modify pre-existing razors to permit added mobility to the head, thereby resulting in an added degree of freedom of the head with respect to the handle. For instance, in razors utilizing a connection such as the insertion of pins on a handle into openings in a shaver head (similar to pins 84a and 84b and cutouts 62, as shown in Fig. 8), the size and/or shape of the openings in the shaver head may be readily modified to add mobility to the shaver head with respect to the handle. This modification can be achieved by conventional processes such as drilling and the like. Alternatively, the mold may be changed to form the shaver head with larger openings into which the pins on the handle are inserted. Thus, in accordance with one aspect of the invention, a pre-existing razor having a head movably coupled to a handle via the connector assembly is modified to permit additional directions of movement between the head and handle as a result of modifying the connector assembly. Such modification may be appreciated with reference to above-described Figs. 3-5, in which shaving head 22 resembles a pre-existing shaving head except for cutouts 62. In a pre-existing shaving head, pins 84a and 84b would be inserted into holes, which substantially conform to the exterior shape of pins 84a and 84b, so that the head pivots about a pivot axis extending through pins 84a and 84b. However, in accordance with the present invention, such holes are enlarged (such as by being configured as elongated cutouts or slots) so that pins 84a and 84b may move in a direction transverse to the pivot axis. More generically, the principles of the present invention may be applied to any connector assembly permitting limited movement between a shaver head and handle to remove restrictions to such movement and thereby impart increased mobility to the head. Thus, any constraints to relative movement between the head and handle are removed while still maintaining a connection between the head and handle.





## CLAIMS

WHAT IS CLAIMED IS:

1 1. A razor, comprising:  
2 a handle having a longitudinal axis;  
3 a shaving head carrying at least one blade with at least one cutting edge and  
4 defining a transverse axis parallel to said at least one cutting edge;  
5 a connector assembly movably coupling said handle to said shaving head;  
6 and  
7 a biasing element spaced from said connector assembly and disposed  
8 between said shaving head and said handle, said biasing element biasing said shaving head  
9 into a rest position;  
10 wherein said connector assembly permits said shaving head to exhibit a first  
11 movement toward and away from said handle into and out of the rest position.

1 2. A razor as in claim 1, wherein said connector assembly further permits a  
2 pivoting second movement forward and backward about a pivot axis parallel to said  
3 transverse axis into and out of the rest position.

1 3. A razor as in claim 2, wherein said biasing element biases said head into the  
2 rest position against said first movement and said second movement.

1 4. A razor as in claim 2, wherein the connector assembly includes at least one  
2 insertion element and at least one cutout shaped to receive said at least one insertion  
3 element, wherein said at least one cutout has dimensions greater than the dimensions of said  
4 at least one insertion element to allow said first movement and said second movement.

1 5. A razor as in claim 4, wherein said at least one insertion element is a pin.

1 6. A razor as in claim 4, wherein said handle, said insertion element, and said  
2 biasing element are a single piece.

1 7. A razor as in claim 4, further including a neck piece coupled to said handle,  
2 wherein said neck piece includes said at least one insertion element.

1            9.        A razor as in claim 1, wherein said biasing element is at least one leaf spring.

1           10.     A razor as in claim 1, wherein said biasing element is a spring-loaded  
2     tongue.

1            11.     A razor as in claim 1, wherein during the first movement, when said shaving  
2     head is moved out of the rest position, said transverse axis is oblique to said longitudinal  
3     axis.

1            12.      A razor as in claim 1, wherein during the first movement, when said shaving  
2      head is out of the rest position, said transverse axis is perpendicular to said longitudinal  
3      axis.

1            13.     A razor as in claim 1, wherein when said shaving head is out of the rest  
2            position, said transverse axis is perpendicular or oblique to said longitudinal axis depending  
3            on the degree and location of at least one force applied to said shaving head.

1        14.        A razor, comprising:  
2                    a handle having a first end, a spaced second end, and a longitudinal axis  
3        extending between said first and second ends;  
4                    a shaving head carrying at least one blade with at least one cutting edge and  
5        defining a transverse axis parallel to said at least one cutting edge;  
6                    a head-engaging element and a handle-engaging element movably coupling  
7        said handle to said shaving head; and  
8                    a biasing element biasing said shaving head into a rest position, said biasing  
9        element and said head-engaging element being disposed only at said first end of said handle  
10        and formed as a single piece.

1           15.     A razor as in claim 14, wherein:  
2                     said connector assembly includes at least one post with a pin extending  
3     therefrom and a cutout for receiving said at least one pin; and





1           28.     A razor system as in claim 26, wherein said biasing element is a spring-  
2 loaded tongue.

1           29.     A razor system as in claim 25, wherein one of said cartridge-engaging  
2 element and said handle-engaging element is an insertion element and the other of said  
3 cartridge-engaging element and said handle-engaging element is at least one cutout shaped  
4 to receive said insertion element.

1           30.     A razor system as in claim 29, wherein said insertion element includes a post  
2 with a pin extending transversely therefrom shaped for insertion into said cutout.

1           31.     A razor system as in claim 29, wherein:  
2                 said post and pin include a first post having a first pin and a second post  
3 having a second pin;  
4                 said at least one cutout includes a first cutout for receiving said first pin and  
5 a second cutout for receiving said second pin; and  
6                 said first and second posts are resiliently movable with respect to each other  
7 to facilitate insertion into and removal of said first and second pins from said first and  
8 second cutouts, respectively.

1           32.     A razor system as in claim 31, further including at least one button coupled  
2 to at least one of said first and second posts to move said at least one of said first and  
second posts upon movement of said button.

1           ~~33.~~     A razor comprising:  
2                 a handle;  
3                 a shaving head carrying at least one blade with at least one cutting edge and  
4 defining a transverse axis parallel to said at least one cutting edge and a longitudinal axis  
5 perpendicular to said transverse axis; and  
6                 a connector assembly comprising a head-engaging element and a handle-  
7 engaging element movably coupling said shaving handle to said head upon coupling said  
8 head-engaging element and said handle-engaging element together;  
9                 wherein said head-engaging element and said handle-engaging element are:  
10                configured for insertion of one into the other to result directly in coupling of  
11 said shaving head to said handle; and

are movable with respect to each other when coupled together to permit said shaving head simultaneously and independently to pivot about said transverse axis in a pitching movement, to move toward and away from said handle with said transverse axis remaining in the same orientation in a cushioning movement, and to pivot about said shaving head longitudinal axis in a rolling movement.

34. A razor as in claim 33, further comprising a biasing element biasing the shaving head into a rest position.

35. A razor as in claim 34, wherein said biasing element is spaced from said head-engaging element and said handle-engaging element.

36. A razor as in claim 33, wherein said head-engaging element and said handle-engaging element are directly coupled together.

37. A razor as in claim 33, wherein one of said head-engaging element and said handle-engaging element is a post with a pin extending therefrom and the other of said head-engaging element and said handle-engaging element is a cutout having dimensions larger than the dimensions of said pin to allow said pitching, cushioning, and rolling movements.

38. A method of modifying a razor having a shaving head movably coupled to a handle to increase the degree of freedom of movement between the shaving head and the handle, the shaving head carrying at least one blade with at least one cutting edge and having a transverse axis parallel to the at least one cutting edge and a longitudinal axis perpendicular to the transverse axis, the shaving head being movably coupled to the handle for pivoting about the transverse axis by insertion of an insertion element on one of the handle and shaving head into a hole in the other of the handle and shaving head, said method comprising the step of:

increasing the size of the hole to form a cutout to increase the mobility of the insertion element therein to permit cushioning movement of the shaving head toward and away from the handle and rolling movement of the shaving head about the transverse axis thereof in addition to the pivoting movement about the transverse axis.





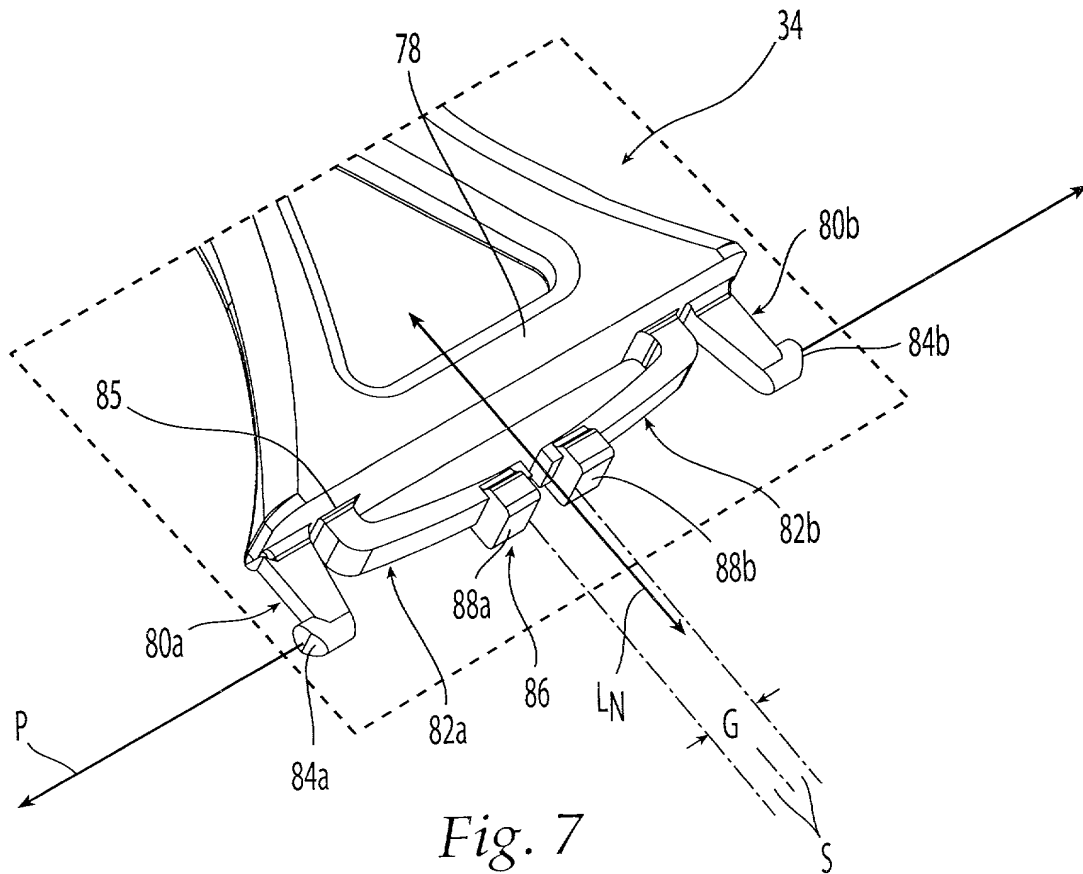
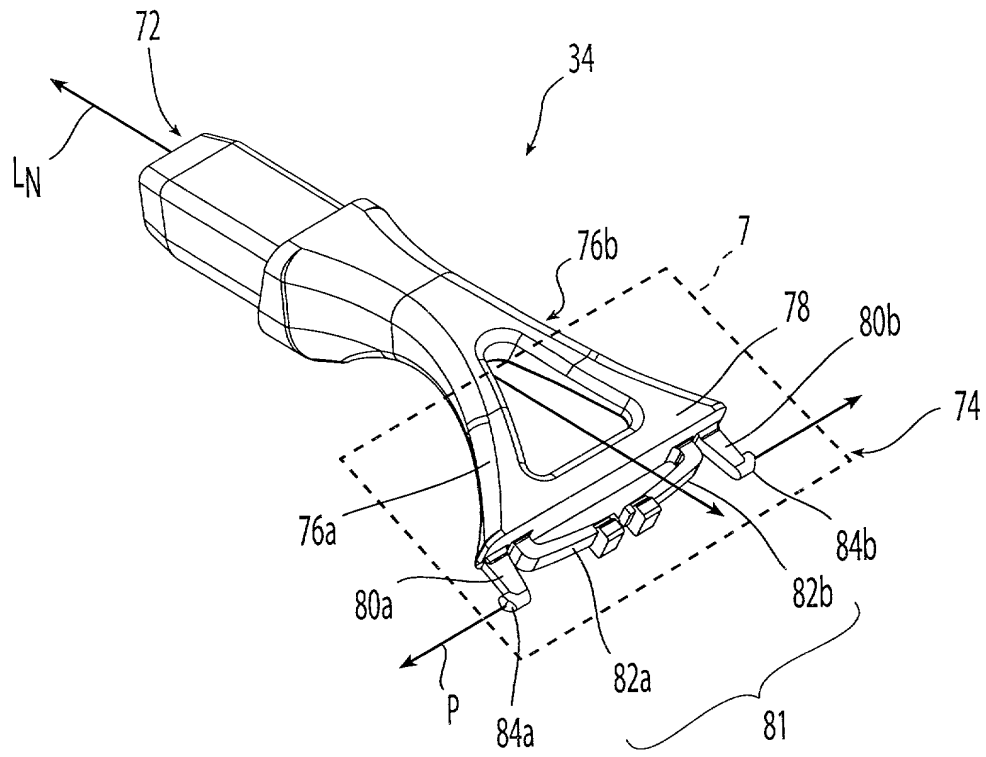


*Fig. 1*









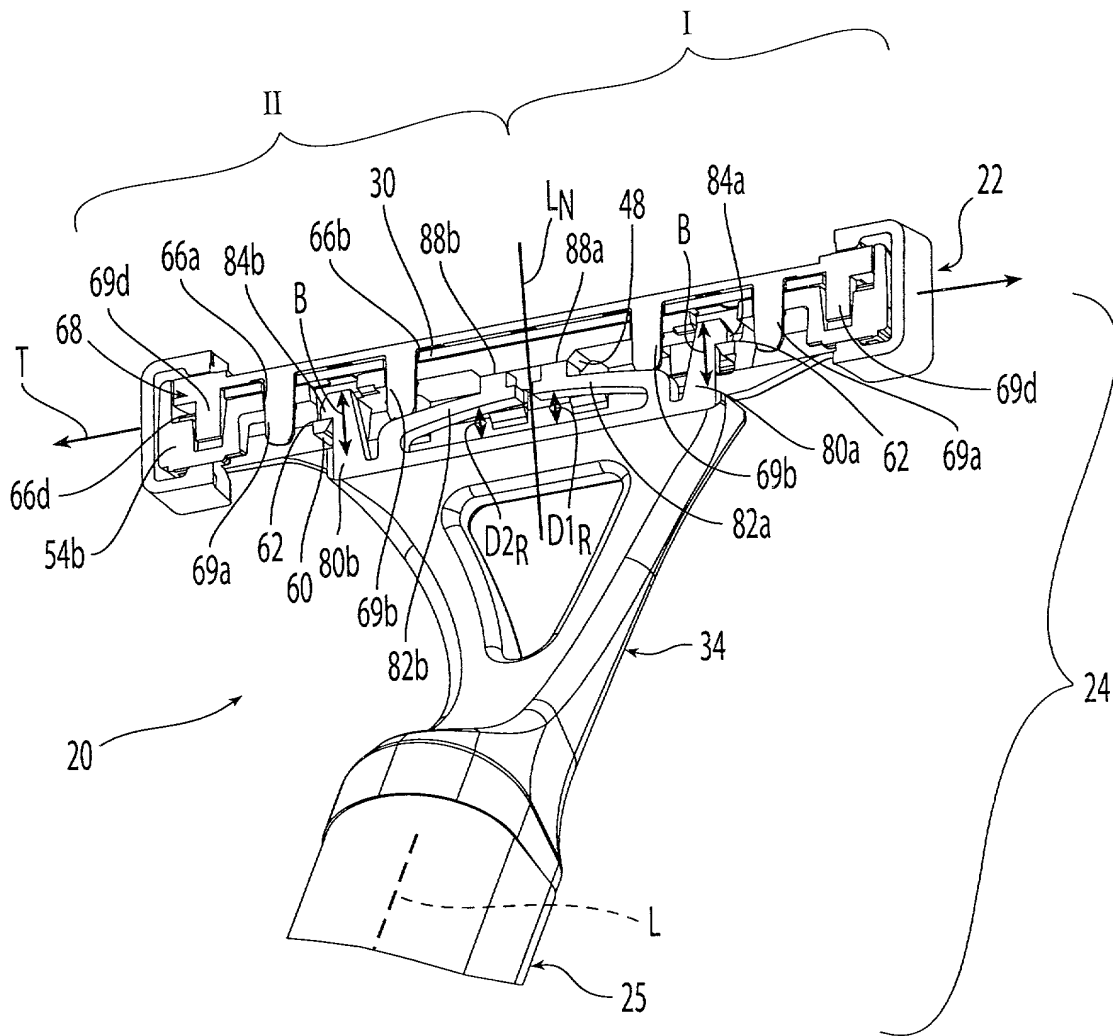
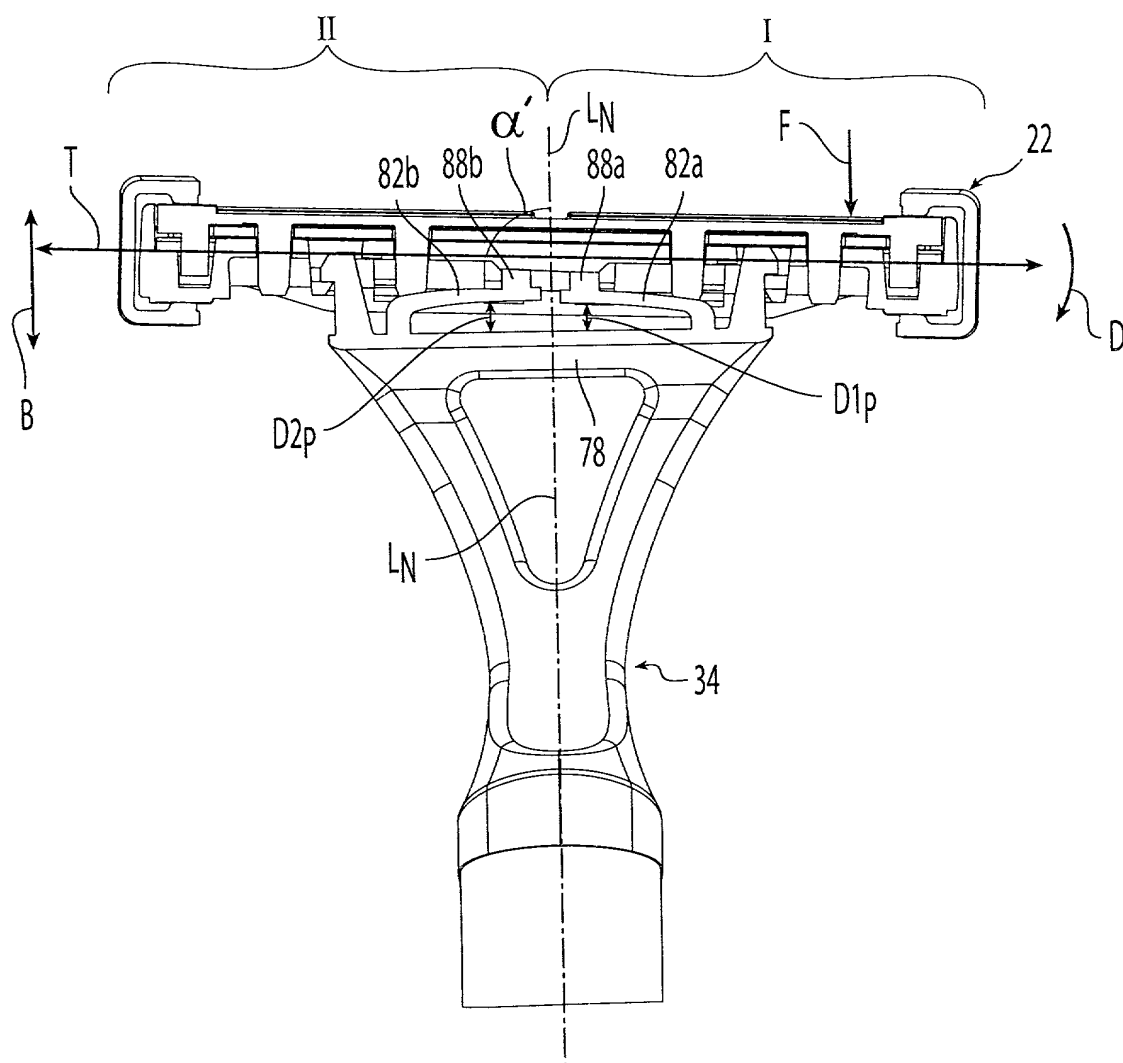


Fig. 8





*Fig. 10*



*Fig. 11*

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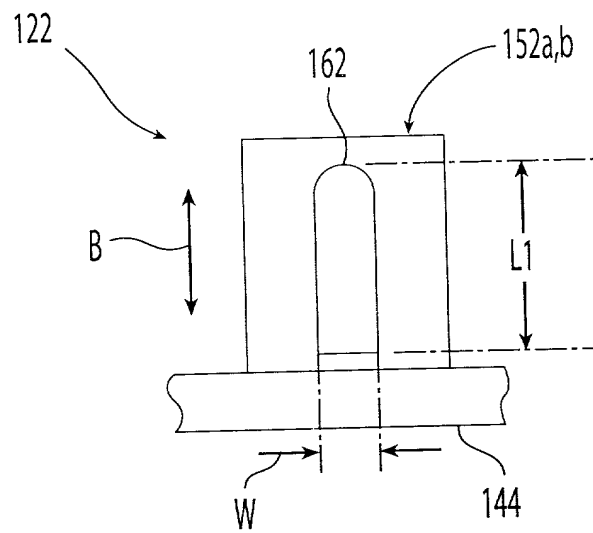


Fig. 12

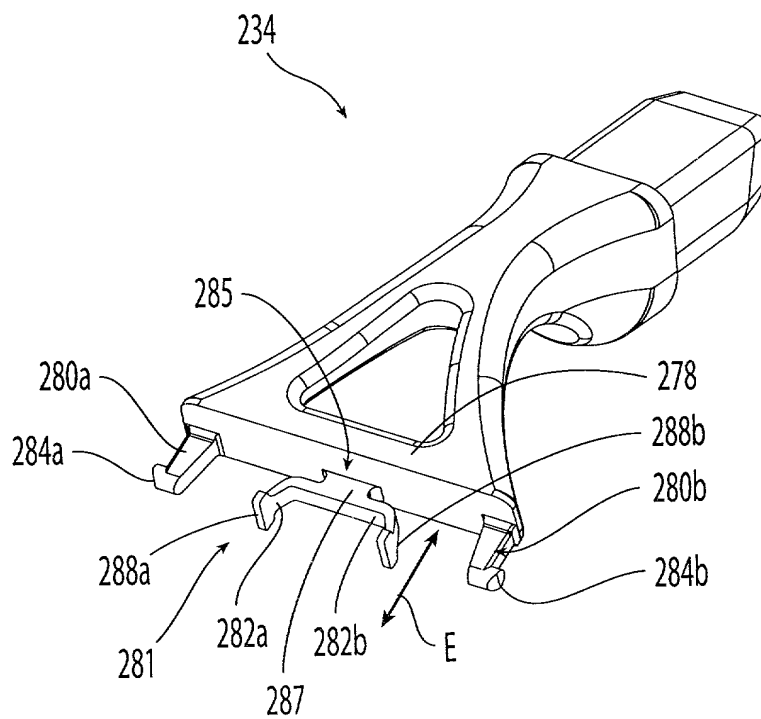


Fig. 13



Fig. 15

# DECLARATION AND POWER OF ATTORNEY

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below at 201 et seq. underneath my name.

I believe I am the original, first and sole inventor if only one name is listed at 201 below, or an original, first and joint inventor if plural names are listed at 201 et seq. below, of the subject matter which is claimed and for which a patent is sought on the invention entitled

## RAZOR WITH A MOVABLE SHAVING HEAD

and for which a patent application:

☒ is attached hereto

☐ was filed in the United States, as Application No.

(for declaration not accompanying application)

with amendment(s) filed on (if applicable)

☐ was filed as PCT international Application No. on and was amended under PCT Article 19 on (if applicable)

I hereby state that I have reviewed and understand the contents of the above identified application, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information known to me to be material to patentability as defined in Title 37, Code of Federal Regulations, §1.56.

I hereby claim foreign priority benefits under Title 35, United States Code, §119(a)-(d) of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed:

EARLIEST FOREIGN APPLICATION(S), IF ANY, FILED PRIOR TO THE FILING DATE OF THE APPLICATION			
APPLICATION NUMBER	COUNTRY	DATE OF FILING (day, month, year)	PRIORITY CLAIMED
			YES <input type="checkbox"/> NO <input type="checkbox"/>
			YES <input type="checkbox"/> NO <input type="checkbox"/>

I hereby claim the benefit under Title 35, United States Code, §119(e) of any United States provisional application(s) listed below.

APPLICATION NUMBER	FILING DATE

I hereby claim the benefit under Title 35, United States Code, §120 of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code §112, I acknowledge the duty to disclose information which is material to patentability as defined in Title 37, Code of Federal Regulations, §1.56 which became available between the filing date of the prior application and the national or PCT international filing date of this application:

APPLICATION SERIAL NO.	FILING DATE	STATUS		
		PATENTED	PENDING	ABANDONED

POWER OF ATTORNEY: As a named inventor, I hereby appoint S. Leslie Misrock (Reg. No. 18872), Harry C. Jones, III (Reg. No. 20280), Berj A. Terzian (Reg. No. 20060), David Weild, III (Reg. No. 21094), Jonathan A. Marshall (Reg. No. 24614), Barry D. Rein (Reg. No. 22411), Stanton T. Lawrence, III (Reg. No. 25736), Charles E. McKenney (Reg. No. 22795), Philip T. Shannon (Reg. No. 24278), Francis E. Morris (Reg. No. 24615), Charles E. Miller (Reg. No. 24576), Gidon D. Stern (Reg. No. 27469), John J. Lauter, Jr. (Reg. No. 27814), Brian M. Poissant (Reg. No. 28462), Brian D. Coggio (Reg. No. 27624), Rory J. Radding (Reg. No. 28749), Stephen J. Harbulak (Reg. No. 29166), Donald J. Goodell (Reg. No. 19766), James N. Palik (Reg. No. 25510), Thomas E. Friebe (Reg. No. 29258), Laura A. Coruzzi (Reg. No. 30742), Jennifer Gordon (Reg. No. 30753), Allan A. Fanucci (Reg. No. 30256), Geraldine F. Baldwin (Reg. No. 31232), Victor N. Balancia (Reg. No. 31231), Samuel B. Abrams (Reg. No. 30605), Steven I. Wallach (Reg. No. 35402), Marcia H. Sundeen (Reg. No. 30893), Paul J. Zegger (Reg. No. 33821), Edmond R. Bannon (Reg. No. 32110), Bruce J. Barker (Reg. No. 33291), Adriane M. Antler (Reg. No. 32605), Thomas G. Rowan (Reg. No. 34419), James G. Markey (Reg. No. 31636), Thomas D. Kohler (Reg. No. 32797), Scott D. Stimpson (Reg. No. 33607), Gary S. Williams (Reg. No. 31066), William S. Galliani (Reg. No. 33885), Ann L. Gisolfi (Reg. No. 31956), Todd A. Wagner (Reg. No. 35399), Scott B. Familant (Reg. No. 35514), Kelly D. Talcott (Reg. No. 39582), Francis D. Cerrito (Reg. No. 38100), Anthony M. Insogna (Reg. No. 35203), Brian M. Rothery (Reg. No. 35340), Brian D. Siff (Reg. No. 35679), and Alan Tenenbaum (Reg. No. 34939), all of Pennie & Edmonds LLP, whose addresses are 1155 Avenue of the Americas, New York, New York 10036, 1667 K Street N.W., Washington, DC 20006 and 3300 Hillview Avenue, Palo Alto, CA 94304, and each of them, my attorneys, to prosecute this application, and to transact all business in the Patent and Trademark Office connected therewith.

**SEND CORRESPONDENCE TO:** PENNIE & EDMONDS LLP  
1667 K. Street NW  
Washington, DC 20006

**DIRECT TELEPHONE CALLS TO:**  
PENNIE & EDMONDS LLP DOCKETING  
(202) 496-4400

201	FULL NAME OF INVENTOR	LAST NAME GYLLERSTROM	FIRST NAME Kenneth	MIDDLE NAME	
	RESIDENCE & CITIZENSHIP	CITY	STATE OR FOREIGN COUNTRY	COUNTRY OF CITIZENSHIP	
	POST OFFICE ADDRESS	STREET	CITY	STATE OR COUNTRY	ZIP CODE
202	FULL NAME OF INVENTOR	LAST NAME	FIRST NAME	MIDDLE NAME	
	RESIDENCE & CITIZENSHIP	CITY	STATE OR FOREIGN COUNTRY	COUNTRY OF CITIZENSHIP	
	POST OFFICE ADDRESS	STREET	CITY	STATE OR COUNTRY	ZIP CODE
203	FULL NAME OF INVENTOR	LAST NAME	FIRST NAME	MIDDLE NAME	
	RESIDENCE & CITIZENSHIP	CITY	STATE OR FOREIGN COUNTRY	COUNTRY OF CITIZENSHIP	
	POST OFFICE ADDRESS	STREET	CITY	STATE OR COUNTRY	ZIP CODE
204	FULL NAME OF INVENTOR	LAST NAME	FIRST NAME	MIDDLE NAME	
	RESIDENCE & CITIZENSHIP	CITY	STATE OR FOREIGN COUNTRY	COUNTRY OF CITIZENSHIP	
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205	FULL NAME OF INVENTOR	LAST NAME	FIRST NAME	MIDDLE NAME	
	RESIDENCE & CITIZENSHIP	CITY	STATE OR FOREIGN COUNTRY	COUNTRY OF CITIZENSHIP	
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206	FULL NAME OF INVENTOR	LAST NAME	FIRST NAME	MIDDLE NAME	
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DATE	DATE	DATE
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